A Dioptrick Problem, *Why four Convex-glaſſes in a Teleſcope, ſhew Objects Erect. by* William Molineux *of* Dublin *Eſq.* R. S. *Soc.*

IN the *Journal des Scavans* for Munday the 17*th.* of *September* 1685. *pag.* 466. *Amſt.* Edition, we find this paſſage. *As Perſpectives of one Convex-glaſs make Objects appear Upright, which thoſe of two Convex-glaſſes invert, and again thoſe of three rectify; ſo it ſhould ſeem that thoſe of four ought to invert: And yet Experience ſhews us that Objects appear upright through theſe glaſſes. The Singularity of this* Phænomenon *obliges all Skil'd in* Dioptricks *to inquire the reaſon thereof, but hitherto they have found none. Mr.* Regis, *who applies himſelf particularly to this part of Natural Philoſophy, beleives that he has hit upon the Reaſou, and makes us hope that he will ſuddenly Publiſh it*

Thus far the *Journal*,but it does not tell us whoſe remark this is, though I am apt to beleive 'twas written by Mr. *Regis* himſelf, to the Publiſher of the *Journal.*

To me this *Phenomenon* appears very eaſily explicable, from the conſideration of placing Glaſſes in a Tube. Which is thus; after the *Object-glaſs*, the *Eye-glaſs* is placed ſo much diſtant (towards the Eye) from the *Focus* of the *Object-glaſs* as is the *Focus* of the *Eye-glaſs*; then the middle *Eye-glaſs* is placed ſo much diſtant from the *Focus* of the firſt *Eye-glaſs*, as is the *Focus* of this middle *Eye-glaſs*; laſtly the neareſt *Eye-glaſs* is placed ſo much diſtant from the *Focus* of this middle *Eye-glaſs*, as is the *Focus* of this neareſt *Eye-glaſs*; and the Eye looking through them all is placed in the *Focus* of this neareſt *Eye-glaſs*.

I ſay therefore firſt, that one ſingle Convex-glaſs, cannot properly be ſaid by it ſelf to ſhew Objects erect or reverſe, but in reſpect of placeing of the Eye that looks through it. For if the Eye that looks through ſuch a ſingle Convex-glaſs

The Royal Society is collaborating with JSTOR to digitize, preserve, and extend access to
Philosophical Transactions (1683-1775).
www.jstor.org

be placed nigher thereto, then the Glaſſes *Focus*, the Objects are erect, if the Eye be placed juſt in the *Focus*, the Objects are neither erect nor reverſed, but all in confuſion between both; and if the Eye be placed further from the Glaſs than the *Focus*, the Objects are reverſed. I mean here diſtant Objects, the Rays flowing from any point whereof may be counted to come parallel towards the *Object-glaſs*, for ſuch Objects we are to conſider when we ſpeak of looking thro' *Teleſcopes*.

This being laid down, I aſſert. Secondly, that the *Object-glaſs* of a Teleſcope reverſes the Object, both to the *Eye-Glaſs* and the Eye, that looks through it: For the *Eye-glaſs* is placed farther from the *Object-glaſs* than is the *Focus* of the *Object-glaſs*. But the *Eye-glaſs* does nothing towards the Rectification or Reverſion; the Eye being placed juſt in it's *Focus*. Thus we ſee that the Reverſing of Objects in a *Teleſcope* of two Convex-glaſſes proceeds wholy from the *Object-glaſs* and its poſition, and the *Eye-glaſs* has nothing to do in the Affaire; for were the Eye it ſelf in the place of the *Eye-glaſs* it would ſee the Objects inverted thro' the ſingle *Object-glaſs*.

I come now to conſider the ſecond *Eye-glaſs* placed after the firſt *Eye-glaſs*. (the firſt *Eye-glaſs* being that next the *Object-glaſs*) And here it is manifeſt that placing this as it ought in a *Teleſcope*, if we place our Eye nearer to this middle *Eye-glaſs* than it's *Focus*, the Eye ſees the Objects inverted and confuſed: Place the Eye in the *Focus*, it ſees the Objects all in confuſion, neither erect nor reverſed; for here again there is a diſtinct Repreſentation of the Objects to be received on a piece of Paper, as in the *Focus* of the *Object-glaſs*; and the Eye being placed at any time at this place (which is uſually called the *Diſtinct-Baſe*) ſees all in confuſion. But then let the Eye be placed farther from this middle Glaſs then its *Focus* (for ſo is the third or immediate *Eye-glaſs*, it being alwayes diſtant from the middle *Eye-glaſs*, the Aggregate of both their *Foci*) it perceives the Objects erect and confuſed.

Laſt-

Laſtly, the third or immediate *Eye-glaſs* does nothing towards the erecting or reverſing the Species, which it receives erect from the middle *Eye-glaſs*; no more than in a Teleſcope of two Convex-glaſſes, the *Eye-glaſs* does to the Species it receives from the *Object-glaſs*, as we have ſhewn before. The reaſon that this laſt or immediate *Eye-glaſs* has nothing to do in the erecting or reverſing the Species is the ſame,as in a Teleſcope of two Convex-glaſſes,*viz.* the Eye is placed in its *Focus*, and therefore ſees the Species as 'tis repreſented in the *Diſtinct Baſe*; that is, the Species is inverted in the *Diſtinct Baſe* of the *Object-glaſs*, and therefore a ſingle Convex *Eye-glaſs* brings it to the Eye inverted; but in the *Diſtinct-Baſe* of the middle or ſecond *Eye-glaſs* the Species is erect, and therefore the third or immediate *Eye-glaſs* brings it to the Eye erect.

Wherefore we are to conſider the Teleſcope conſiſting of an *Object-glaſs* and three *Eye-glaſſes*, as two Teleſcopes, each conſiſting of two Convex-glaſſes. The firſt conſiſts of the *Object-glaſs* and firſt *Eye-glaſs*, and this inverts the Species; that is, the Species is inverted in the *Diſtinct-Baſe* of the *Object-glaſs*, and ſo brought into the Eye. The ſecond Teleſcope conſiſts of the two immediate *Eye-glaſſes*, and this erects what the former inverted, that is, the Species in the *Diſtinct-Baſe* of the middle *Eye-glaſs* is erect, and is ſo brought into the Eye by the *Eye-glaſs*; the *Eye-glaſſes* themſelves in neither caſe having any thing to do with the erecting or inverting, but meerly in repreſenting in the ſame poſture the Species immediatly before them.

The *French* Problem therefore ſhould not have broken a Teleſcope of four Convex-glaſſes into four peices, but into two, and the caſe would have been plain; whereas by breaking it into four Perſpective-Glaſſes, they attribute that to two of them, which neither of them does, *viz.* inverting and erecting.

Therefore I ſay laſtly, that one Convex-glaſs as poſited in a Teleſcope inverts; the ſecond (that is the firſt *Eye-glaſs*)

does

does nothing towards erecting or reverſing, but repreſents the Image as it is in the *Diſtinct-Baſe* of the *Object-glaſs* before it, that is, inverted. The third Glaſs erects, or rather reſtores what was before inverted. The fourth repreſents the Image as it receives it from the *Diſtinct-Baſe* of the third, that is, erect. And this I think a ſufficient Solution of this Problem.

An uncommon Inſcription *lately found on a very great* Baſis *of a Pillar, dug up at* Rome; *with an Interpretation of the ſame by the learned Dr.* Voſſius.

THis Inſcription was ſent by that excellent Philoſopher and Mathematician Mr. *Adrian Auzout*, who coppyed it from the Stone, to Mr. *Juſtel*, who was pleaſed to communicate it to the *Royal Society*, together with the Sentiments of Dr. *Voſſius* therupon, of which the Reader may Judg.

The Inſcription is three fold upon three ſides of the Baſis, and as follows.

P. SVFENATI. P. F. PAL. MYRONI

EQVITI. ROMANO. DECV

RIALI. SCRIBARVM. AEDILI

VM. CVRVLIVM. LVPERCO. LAVRENTI

LAVINATI. FRETRIACO. NEAPOLI. ANTI

NOITON. ET. EVNOSTIDON. DE

CVRIONI. $\overline{\mathrm{IIII}}$, VIRO. ALBA

NI.